

Mechanisms: making things move

Lesson at a glance

Open with a finished bird moving-picture: one push on the side strip flaps the wing, then freeze and gather everyday examples. Name input, output, pivot and mechanism on the board, then model pinning a pre-cut wing and strip live so the class sees each joint. Groups build a lever-and-linkage scene from pre-cut card and split pins, test one input change at a time, and record prediction-plus-notice notes before drawing and labelling input, output and pivot on the Investigation Journal page. Close with one or two short demos and careful pin collection.

Learning objectives

- Build a simple lever-and-linkage or cam mechanism
- Explain how an input movement produces an output movement
- Draw and label the mechanism showing input and output

Before the bell: prep

Pre-cut bases, body/scene shapes and input strips for every group the day before; cereal-box card is fine. Ready one finished bird linkage to demo, spare split pins, pencils, tape/glue, scissors. Optional stretch only: finished cam toy plus blunt-tip dowels and off-centre cam discs. Investigation Journal pages on desks with the kit.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
stiff card (A4 or cereal-box card), including pre-cut bases and input strips	3	group	classroom	flattened cereal boxes cut into panels
split pins (paper fasteners)	6	group	school kit	short lengths of soft wire twisted as pivots (adult help)
scissors (pupil, round-tip preferred)	1	pupil	classroom	shared scissors per pair with adult cutting support
short wooden dowels or blunt wooden skewers	2	group	classroom	thick drinking straws or rolled paper tubes for axles
glue stick or sticky tape	1	group	classroom	masking tape only
pencils	1	pupil	classroom	any writing pencil
Investigation Journal page	1	pupil	classroom	plain A4 sheet labelled Investigation Journal
finished lever-and-linkage example for the hook and demo	1	class	classroom	join the pre-cut linkage demo live in the demonstration step and skip a pre-made hook model
finished cam toy (stretch reference only)	1	class	classroom	skip if unavailable; do not offer cam stretch without a finished reference

Safety watch-point

Collect loose split pins first at pack-away: they scatter and are sharp. Supervise scissors; stretch cam groups use only blunt-tip dowels or skewers.



Teaching moves

- **Getting Started:** Hold the finished bird picture, give one short push so the wing flaps, then freeze. Ask what the hand did, what moved, and what stayed still. Take everyday ideas quickly (door handle, scissors, see-saw) without naming parts yet.
- **What is a mechanism?:** Point at the demo bird and write only four words on the board: mechanism, input, output, pivot. Trace the chain aloud: hand on strip → linkage → wing. Head off 'it moves by itself' by insisting nothing moves without an input. Keep cam and follower off the board unless a finished cam appears later.
- **Watch one being made:** Join pre-cut parts live facing the class: pin wing to body so it swings, pin strip to wing with a little free play. Before the first push, take a show of hands. Will the wing, body or base move? After the flap, ask where movement started and ended. If a finished cam is on the side table, give a 20-second side-by-side turn; otherwise skip cam entirely.
- **Build your mechanism:** Groups of three on the default path: lever-and-linkage moving picture from pre-cut base and strip. Demonstrate once: wiggle the pencil so the pivot hole is slightly bigger than the pin, and leave pin legs slack. Circulate asking 'Show me the input. Show me the output. What is the pivot doing?' Stretch cam only after a working linkage and only if the finished model is present.
- **Test the input and output:** Prompt: change only one thing about the input (how far, how fast, or which direction) and keep the same start position. Journal notes are short prediction and what changed; drawings wait. If a group says it is broken, enlarge the push or free a binding pin and re-test.
- **Watch the movement path:** Have groups run the input at half speed. Look for fixed base versus swinging parts, rotation around a pivot versus a straight strip push. If a path is hard to see, a partner holds a pencil tip above the moving part to track the arc in the air.
- **Draw and label your mechanism:** Remind: clear simple diagram beats a fancy picture. Labels must name input, output and at least one pivot (or cam and follower for stretch). If a pupil draws the whole scene unlabelled, ask them to point first, then write the three words beside those parts.
- **Share and pack away:** One or two contrasting demos under a minute each; echo their talk with the key words. Use the classroom door handle as the worked example of input and output. Collect loose split pins first while pupils are still seated, then skewers and scissors.

What it should show

A successful build shows one clear user-controlled input, one visible output, and parts that stay joined at the pivots so the group can point to input and output unprompted. Expect first attempts that barely move: shifting the strip pin further from the wing pivot gives a bigger flap. Odd results usually mean pins too tight (jam), too loose (fall apart), strip glued solid instead of pinned, or a cam centred on the axle with no rise and fall.

**Misconceptions & interventions**

- **Pupils say the whole picture ‘moves by itself’ once it is built.** Trace the chain on their model with a finger: input on the strip → linkage around the pivots → output on the wing. Ask them to freeze the input and watch the output stop.
- **If nothing seems to change on a re-test, pupils decide the mechanism is broken.** Check for a binding pin or a push that was too small. Free the pivot or enlarge the input change, keep the same start position, and re-run so they see the output respond.
- **Pupils glue or tape the input strip solid to the base, so nothing can turn.** Show their joint beside a working pinned strip: a pivot hole must be slightly bigger than the pin, and the pin legs stay slack so the part can swing.

Differentiation

Emerging	Developing	Proficient
• Offer a two-piece linkage only (base + one moving arm) on pre-cut parts and sit with the teacher table to place the first pivot. • Sentence starter on the Journal: When I pushed/pulled... the... moved.	• After a working single linkage, adjust pivot distance and re-test one input change (further push or opposite direction) with a Journal note. • Ask them to point and name input, output and pivot for a neighbouring group.	• Add a second linkage so one push moves two parts, or cut a fuller scene from blank card once the first linkage works. • If the finished cam model is on the side table, build a simple cam-follower and label axle, cam and follower on the Journal.

Cross-curricular hook

Link to local canal lock gates or farm gate latches (one long push on a beam swings a heavy gate) plus a quick oral recount in English of input and output.